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(54) Debris Collecting Device

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No. OF CLAIMS 15

Canada

FIG.7

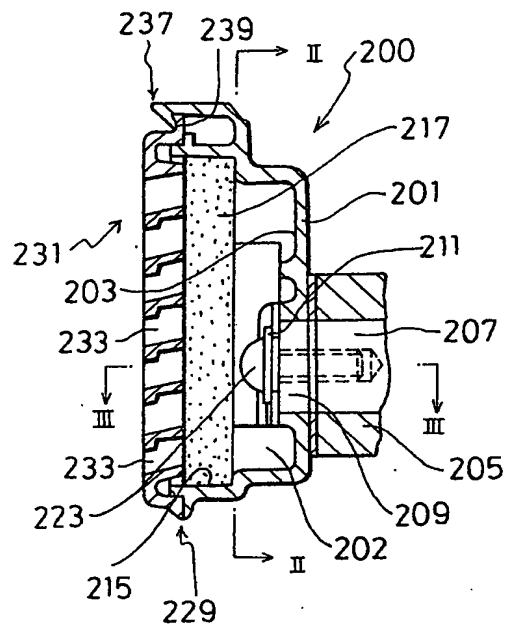


FIG. 8

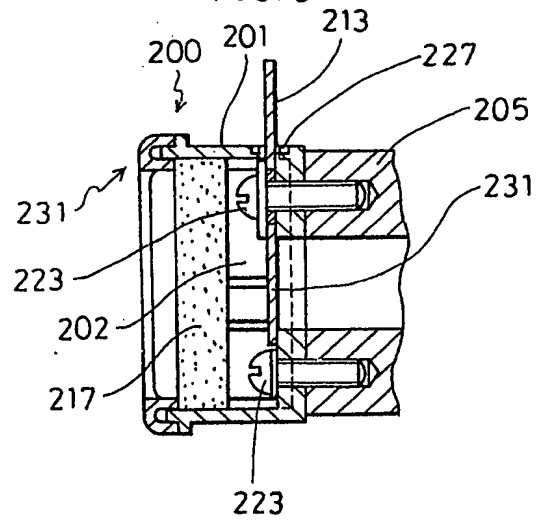


FIG. 1

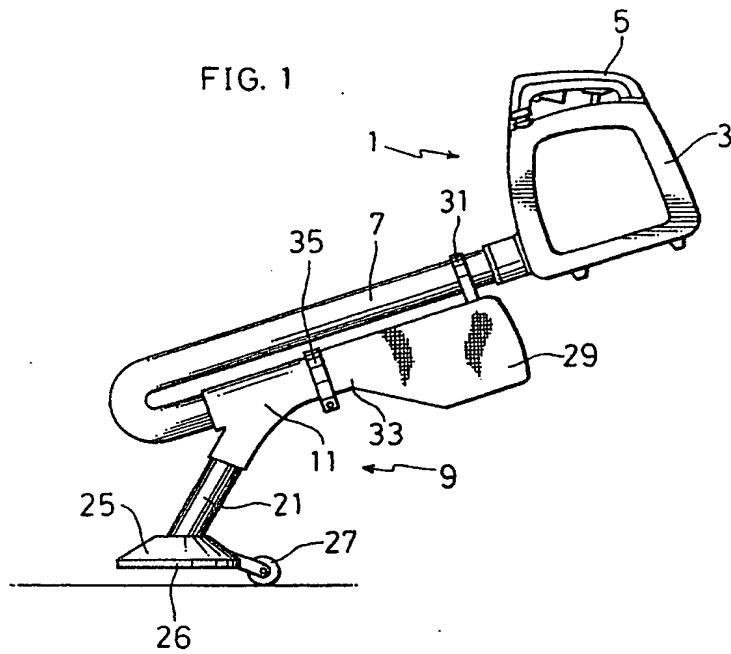


FIG. 2

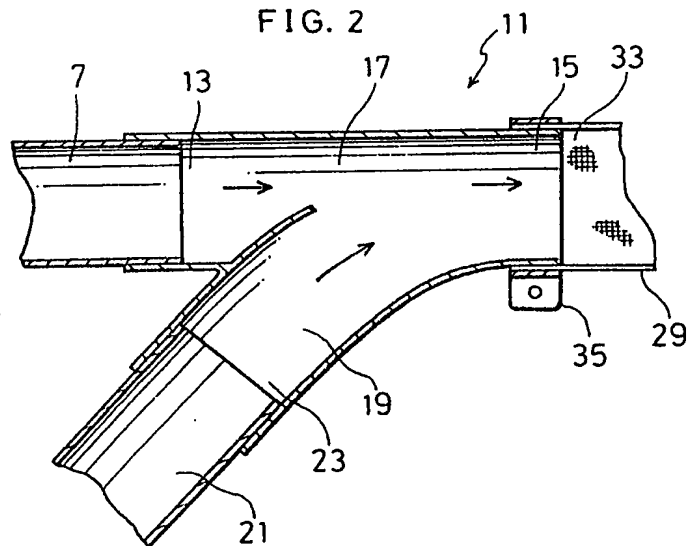


FIG. 3

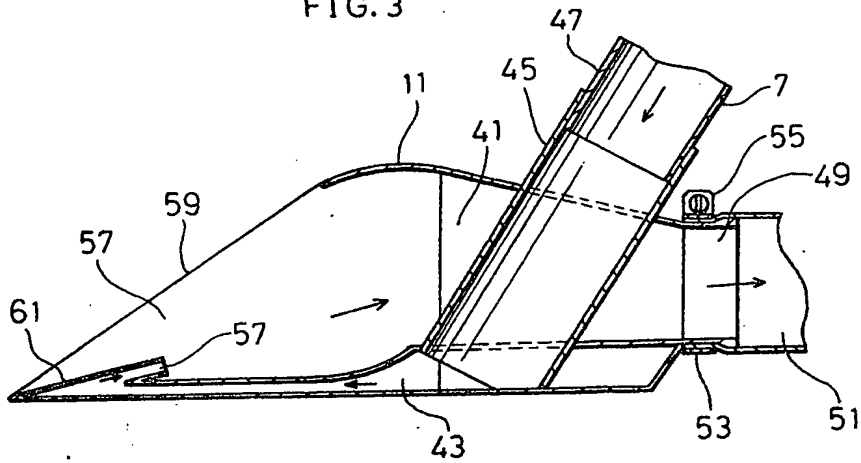
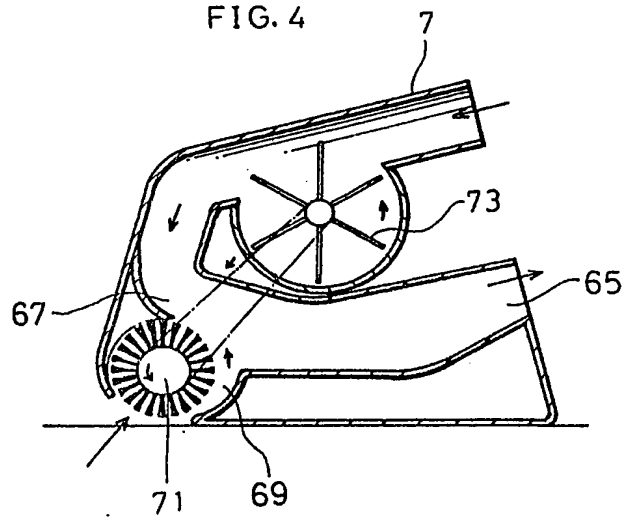


FIG. 4



DEBRIS COLLECTING DEVICE

The present invention relates to a device for collecting debris such as fallen leaves from the surface of the ground.

The conventional collecting device of this type is constructed in such a manner that suction generated by the device draws the debris such as fallen leaves from the ground surface into the device where the material is separated by a filter and collected. Since a portion of the debris drawn into the machine is in the form of fine particles, which pass through the filter, those particles
10 rub against internal components of the debris collecting device and accelerate the wear of those parts of the device. Further, when a device is designed to collect only large debris such as fallen leaves, large filter meshes are used allowing a large number of smaller particles to pass through the filter and create possible problems with the operation of the machine. In addition, when a simple bag-like filter is used, a cover for the filter is required, which causes the construction to be complicated.

Summary of the Invention

20 The present invention proposes a new type of debris collecting device and a technique associated therewith which avoids the drawing of debris through the moving components of the suction device, is simple in construction, and easily separates and collects debris. A collecting passage is provided through which debris is drawn from the ground, which passage has a negative pressure therein due to flow thereacross through an intersecting flow passage.



Brief Description of the Drawings

Fig. 1 is a side view of a suction device in one embodiment of the present invention.

Fig. 2 is a sectional view of the intersection of a collection passage and a blow passage in the suction device of Fig. 1.

Fig. 3 is a sectional view of the intersection of a collection passage and a blow passage in another embodiment of the invention the construction of the embodiment shown in Fig. 2.

10 Fig. 4 is a sectional view of the intersection of a collection passage and a blow passage in a further embodiment of the invention, also illustrating a scraper at the collection passage.

Fig. 5 shows an embodiment of the invention in which the collection passage has a chemical tank attached thereto, flow in the collection passage drawing chemicals into the passage from the tank.

Fig. 6 is a side sectional view of a blower utilized in one embodiment of this invention.

20 Figs. 7 and 8 are embodiments of an air cleaner.

Detailed Description of the Preferred Embodiment

The present invention relates to a device for collecting debris such as fallen leaves from the surface of the ground.

The conventional collecting device of this type is constructed in such a manner that suction generated by the device draws the debris such as fallen leaves from the ground surface into the device where the material is separated by a filter and collected. Since a portion of the debris drawn into the machine is in the form

of fine particles, which pass through the filter, those particles rub against internal components of the debris collecting device and accelerate the wear of those parts of the device. Further, when a device is designed to collect only large debris such as fallen leaves, large filter meshes are used allowing a large number of smaller particles to pass through the filter and create possible problems with the operation of the machine. In addition, when a simple bag-like filter is used, a cover for the filter is required, which causes the construction to be complicated.

10 The present invention proposes a new type of debris collecting device and a technique associated therewith which avoids the drawing of debris through the moving components of the suction device, is simple in construction, and easily separates and collects debris. A collecting passage is provided through which debris is drawn from the ground, which passage has a negative pressure therein due to flow thereacross through an intersecting flow passage. With reference to Figures 1 and 2, a primary embodiment of the present invention will now be discussed in detail.

20 In the Figures, reference numeral 1 designates a portable blower, 3 a case containing an engine and a blower fan (one form of which is shown in Fig. 6 and discussed below), 5 a handle disposed on an upper portion of the case 3, and 7 a blow pipe through which air is blown. Debris collecting device 9, which is mounted removably on an end of blow pipe 7, is constructed in the following manner. Reference numeral 11 designates a joining pipe which is fitted into an end of the blow pipe 7. A collection passage 19 flows at an angle into blow passage 17 which has a flow-in port 13 and a flow-out port 15, collection passage 19 being

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directed toward flow-out port 15. Collection passage 19 and flow-out port 15, with which it communicates, have a corresponding internal diameter. Collection pipe 21 is fitted into the flow-in port of collection passage 19 and has fixed to its lower end the small upper end of a conical-shaped debris gathering member 25 which has an open lower end 26. A reference numeral 27 is a support wheel provided to rotate on a rear portion of the debris gathering member 25. A reference numeral 29 is a debris collecting bag suspended by a fitting 31 at a lower portion of the blow pipe 7.

10 The opening 33 of bag 29 is fitted over the outer periphery of flow-out port 15 and secured thereto by fitting 35.

In carrying out the debris collecting operation with the construction described above, an operator holds a handle 5 by one hand and the blow pipe 7 by the other hand, contacts the ground surface with support wheel 27, maintains a suitable spacing between the lower surface of the debris gathering member 25 and the ground surface, and moves the debris collecting device forward. The airstream which is generated by the blowing fan which is incorporated in case 3 passes through blow passage 17 entering at
20 flow-in port 13 of the joining pipe 11 at high speed and leaving at flow-out port 15 to enter debris collecting bag 29, from which it is discharged through the cloth mesh. When the airstream passes through the blow passage 17 at high speed, the air in the collection passage 19 moves toward the reduced pressure of the airstream, so that the air is sucked in from the open lower end 26 of the debris gathering member 25. Thus debris, which is "sucked" from the ground, passes through collection pipe 21, then through collection passage and is then mixed with air in blow passage 17,

Finally entering the dust collecting bag where it is separated from the airstream and collected.

As is apparent from the foregoing description, the present invention has the following effects.

(1) Since the debris gathering member can be mounted directly on the portable blower, the blowing and gathering operations of fallen leaves and the like and the debris collecting operations can be carried out interchangeably.

10 (2) The diameter of the blow pipe and the like is small and compact.

(3) Since the mesh of the filter is not required to be made small, the load on the blower motor is small and overheating is prevented.

(4) Debris is not sucked through the wind blowing machine and its operation is not impeded.

(5) The separation and collection of the debris can be easily done and a case for accommodating the debris collecting bag is not required.

20 Next there will be explained another embodiment, as shown in Fig. 3. This embodiment provides a blow passage, through which is blown an airstream, and a debris gathering member for guiding debris on the ground surface in the direction of the blow passage so that the debris enters the airstream. Reference numeral 7 refers to a blow pipe for carrying the airstream, which airstream is generated by the blowing fan. Reference numeral 11 refers to a joining pipe member, the internal chamber of which is partitioned horizontally and divided into an upper chamber 41 and a lower chamber 43. A reference numeral 45 is a
30 communicating pipe for communicating the wind blow pipe 7 with lower chamber 43 and into an upper end portion of the communicating pipe is removably fitted an end of a slightly-inclined conical blower

pipe 7. Reference numeral 49 refers to an exhaust port opening in the rear of upper chamber 41, to which opening an entrance end 53 to a debris collecting bag 51 is removably fitted and fixed by a fitting 55. Reference numeral 57 refers to an injection port opening which is directed toward the rear of upper chamber 41, the port opening being in the front end of lower chamber 43. The blown airstream is directed through blow pipe 47, communicating pipe 45, lower chamber 43, injection port 57, upper chamber 41, and exhaust port 49, into dust collecting bag 51. A reference numeral 58
10 is a debris collecting passage joining the blow passage in upper chamber 41 to the forward opening of upper chamber 41. Reference numeral 61 refers to a plate-like scraper which sits on the lower portion of opening 59.

Fig. 4 shows an embodiment in which an injection port 69 has an upper portion connecting to a debris collecting passage 67. The airstream is branched, with brush-like scraper 71 at injection port 69 being rotated by its connection to rotor 73, which is rotated by the airstream.

20 In one embodiment, as the rotor rotates, a chemical is transferred to the side of the rotor. The chemical is blended into the airstream in the blow pipe, passes through the blow pipe and is ejected by the nozzle. When the quantity of air flowing through the blow pipe is increased, the rotation speed of the rotor is increased, and the feeding rate of the chemicals by the transfer device is also increased. In the case of reduced air flow, the reverse result is obtained, so that the quantity of dispersed chemical can be constantly maintained.

In Fig. 5, reference numeral 7 is a flexible blow pipe for guiding the airstream from the blower 3, and 75 is an injection nozzle situated on the end of the blow pipe through which flow passes from blow pipe 7 to injection port 77. A suction passage 81 joins injection nozzle 75 at an angle, being directed toward the downstream side of the airflow. 83 is a suction pipe communicating with suction passage 81 and having at the other end a suction port 85. Intermediate the ends is an injection nozzle 91 with a tube 89 flowing thereinto, the other end of
10 the tube connecting with a tank 87.

As another embodiment, a rotor is disposed to rotate in a passage carrying a blown airstream according to the rate of flow of the airstream, and the rotation of the rotor drives a chemical transfer device to transfer chemicals in a chemical tank to the passage.

As another embodiment, a chemical liquid tank is removably provided in the passage carrying the blown airstream, a tube is provided having one end facing into the airstream and the other end connected to the upper portion of the chemical
20 tank, and a liquid feed passage is provided connecting the bottom portion of the chemical liquid tank with an injection hole disposed in the passage carrying the blown airstream.

By joining the blow passage, through which passes the airstream to the debris collecting container, to the debris collection passage, through which is guided debris on the ground surface to the blow passage,

the container can be removably mounted on the blower.

Also, with respect to the filter face, the airstream contacts the face at a slanted direction, and a debris collecting container can be provided below the filter against which the airstream blows.

10 The blow passage, through which is blown the airstream to the debris collecting container from the blower is joined to the debris collecting passage, through which is guided debris on the ground surface to the blow passage, the debris collecting container being separate from the blower, and said member on the ground, and it can be provided through a flexible pipe in the wind blow passage between said debris collecting passage and the debris collecting container.

20 A cylindrical discharge port member has a division line extending axially and an outer cylindrical cylinder is fitted into the outer periphery of the discharge port member in an internal portion of the discharge port member, in such a manner that a rigid blow pipe made of rigid material is fittably shaped, and an outer peripheral portion of said outer cylinder may be disposed in a shape of a fittable flexible blow pipe made of flexible material.

Also, a blow passage, through which an airstream is blown to the debris collecting container from the blower, may be joined to a debris collecting passage, through which debris on the ground surface may be guided to the blow passage, and the debris collecting container may be removably mounted on the blower.

In Fig. 6, another embodiment of the present invention is shown. A reference numeral 101 designates a blow pipe fitted into a discharge port 107 which is fixed to a front face portion 105 of a case 103 and has a nozzle provided at an end. 129 is a connecting rod, 131 is a fly wheel fixed to the other end of a shaft 125, 135 is a recoil starter, 139 is a fan fixed to the fly wheel 131 by means of a bolt 141, 143 is a fan case enclosing the fan 139. A discharge port 107 is provided at the front surface portion 105 of case 103. 147 is a suction portion disposed at a center portion of the fan case 143. 149, 151 are respectively air entrance ports disposed at a front face portion 105 of the case 103 and at a rear face portion 106 of the case 103 and communicating with the inner chamber 147 through wind suction passages 155, 157, respectively. 159 is an air cleaner fixed to the carburetor 163 of the engine. 165 is a muffler communicating with the air exhaust port of the engine. 169 is a cylinder cover. 173 is a muffler cover covering a muffler 165. Exhausted air is mixed with the exhaust discharged from the discharge port 174 of the muffler 165. 177 is an exhaust port opening to a rear face portion 153 of the case 103, and is constructed in such a manner that the exhaust air exhausted from the exhaust pipe 175 is discharged through the exhaust port 177.

In the above-mentioned construction, the operator holds the handle and the blow pipe. With the engine operating, air blown by a rotating fan 139 is ejected from the blow nozzle. The air which is driven by the fan is sucked in from the air suction ports 149, 151, which are provided at the front and rear

surface portions 105 and 106, respectively, passes through the suction wind passages 155, 157, and is sucked into the inner chamber 147. The exhaust air of the engine enters the muffler 165 from the air exhaust hole and leaves the muffler through discharge port 174, passes through exhaust pipe 175, and finally is exhausted through exhaust port 177.

10 It is understood that the air entrance port may be alternately disposed. An entrance port is provided in either a front face portion or a rear face portion or an upper face portion; also, an exhaust port may be opened toward the rear face portion. When the operator holds either the left or right sides of the portable blower, his clothes are not sucked into the air entrance port and hot air from the exhaust port is not blown at the operator.

Also, in the front portion of the case for accommodating the engine and the blower, the blow pipe communicating with the discharge port of the blower is fixed. One of the air entrance ports communicating with the inner chamber of the wind blower and the exhaust port for exhausting the air exhaust of the engine are opened. The air entrance ports that may be opened are disposed
20 on at least one face portion of the front face portion, the rear face portion and the upper face portion of the case.

In another embodiment, a cylinder cover is disposed on an outer periphery of the cylinder for guiding the airstream from the fan. A passage receives air guided to the cylinder cover and guides it to the outer atmosphere. The exhaust port of the muffler may be opened into the passage.

The case for accommodating the engine and the blower may be formed by dividing it into a main body portion and a cover portion. A lower end portion of said cover portion is engaged removably to the main body, and on one of the upper end portions of the cover portion and the main body portion engaging pieces are provided. An engaging jaw may detachably engage another engaging jaw, and a press piece may disengage the engaging jaws.

10 In the air cleaner shown in Figs. 7 and 8, in the main body 201 one direction opening internal chamber 202 is disposed, and on a bottom portion 203 of the main body 201, a communication port 209 connects the internal chamber 202 to a suction port 207 of the carburetor 205. In an opening portion 215 of said internal chamber 202, a debris catching filter 217 made of porous synthetic resin and the like is fitted. A bottom portion of the main body 201 is mounted on the carburetor 205 by means of a bolt 223. To one end of the bolt 223 an opening and closing arm portion 213 of a shutter for opening and closing said communication port 209 is fitted to an outer periphery of a collar which is fitted into a bolt 223 and swingably pivoted. To an outer end 20 portion of the opening and closing arm portion 213, an operating wire is connected. On a side wall of main body 202, a long hole is provided and along both edges of the long hole a seal plate is disposed in a form protruding outward. Said opening and closing arm portion 213 is disposed so as to swing and penetrate through said seal plate. To said main body 201, by means of the foldably bent portion 229, a cover portion 231 is attached, and in the cover portion 231, vent holes 233, 233 are disposed. On an upper portion of said main body 201, through the foldably bent portion 229, an

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engaging portion 237 is disposed so as to be detachably engaged with the engaging jaw 239 disposed at an end portion of the cover portion 231. Further, said main body 201 and the cover portion 231 are formed integrally with flexible material such as soft synthetic resin.

10 The air taken in through the vent holes 233, 233 passes through the filter 217 to remove debris in the air, through the communicating port 209, through the air suction port 207, and thence to the carburetor 205. When changing the filter 217, the engaging portion 237 of the main body 201 is disengaged from the engaging jaw 239 of the cover portion 231 to open the cover portion 231. The contaminated filter 217 is taken out, and a new filter is inserted into the opening.

Accordingly, a debris catching filter can be easily replaced, and the main body of the air cleaner can be easily mounted. Furthermore, the number of parts can be reduced, the cost can be low, and the manufacture can be made easy.

CLAIMS

1. A debris collecting device comprising:

(a) a debris collecting passage for directing debris on the surface of the ground into the airstream of a blower; and,

(b) an air flow passage intersecting the debris collecting passage and carrying the blown airstream, wherein the blown airstream passage which connects to the discharge port of the blower is fixedly located in a case accommodating the blower and an engine for the blower, an air suction port connecting to an inner chamber of the blower is located on at least one of a front face portion, rear face portion and upper face portion of the case, and an engine exhaust port is located at the rear face portion of the case.

2. A debris collecting device, characterized by a debris collecting passage for guiding debris on the ground surface in the direction of the airstream of an air flow passage, at least a portion of said airstream being directed in the direction in which the debris is guided, the blown airstream passage connecting to the discharge port of a blower fixedly located in a front portion of a case for accommodating the blower and an engine for the blower, an air suction port connecting to an inner chamber of the blower being located on at least one of a front face portion, rear face portion and upper face portion of the case, and an engine exhaust port being located at the rear face portion of the case.

3. A debris collecting device as in claim 1 or 2, characterized by a scraper for scraping the debris off the ground surface and guiding it to the passage carrying the blown airstream.
4. A debris collecting device as in claim 1, and also comprising:
- (a) a chemical liquid tank removably provided in the passage carrying the blown airstream;
 - (b) a tube having one end facing into the airstream and the other end connected to the upper portion of the chemical tank; and
 - (c) a liquid feed passage connecting the bottom portion of the chemical liquid tank with an injection hole disposed in the passage carrying the blown airstream.
5. A debris collecting device as in claim 2, and also characterized by a chemical liquid tank being removably provided in the passage carrying the blown airstream, a tube being provided having one end facing into the airstream and the other end connected to the upper portion of the chemical tank, and a liquid feed passage being provided connecting the bottom portion of the chemical liquid tank with an injection hole disposed in the passage carrying the blown airstream.
6. A debris collecting device as in claim 5, and further characterized by a scraper for scraping the debris off the ground surface and guiding it to the passage carrying the blown airstream.
7. A debris collecting device comprising:
- (a) a debris collecting passage for directing

debris on the surface of the ground into the airstream of a blower; and,

(b) an air flow passage intersecting the debris collecting passage and carrying the blown airstream, wherein the discharge port of the blower, which connects to the blown airstream passage, and an air suction port, which connects to an inner chamber of the blower, and an engine exhaust port are all in a front portion of a case accommodating the blower and an engine for the blower, and another air suction port is located on at least one of the front face portion, a rear face portion and an upper face portion of the case.

8. A debris collecting device, characterized by a debris collecting passage for guiding debris on the ground surface in the direction of the airstream of an air flow passage, at least a portion of that airstream being directed in the direction in which the debris is guided, the discharge port of the blower, which connects to the blown airstream passage, an air suction port, which connects to the inner chamber of the blower, and an engine exhaust port all being located in a front portion of a case accommodating the blower and an engine for the blower, and another air suction port being located on at least one of the front face portion, a rear face portion and an upper face portion of the case.

9. A debris collecting device, characterized by a passage carrying a blown airstream and a scraper for scraping the debris off the ground surface and guiding it to the passage, the discharge port of the blower, which connects to the blown airstream passage, an air suction port, which

connects to the inner chamber of the blower, an engine exhaust port all being located in a front portion of the case accommodating the blower and the engine for the blower, and another air suction port being located on at least one of the front face portion, a rear face portion and an upper face portion of the case.

10. A debris collecting device as in claim 1, and also comprising:

(a) an air cleaner having a main body and an internal chamber therewithin, a port being at one end of the chamber, the port connecting the internal chamber with an air suction port of a carburetor, the port having a swingable shutter for opening and closing the port, that shutter having an opening and closing arm portion penetrating through a seal plate formed to protrude outwardly along both edges of a long hole disposed on a side wall of the main body, the seal plate and main body being formed integrally from a soft flexible synthetic resin or a like material.

11. A debris collecting device as in claim 2 and being further characterized by an air cleaner having a main body and an internal chamber therewithin, a port being at one end of the chamber, the port connecting the internal chamber with an air suction port of a carburetor, the port having a swingable shutter for opening and closing the port, that shutter having an opening and closing arm portion penetrating through a seal plate formed to protrude outwardly along both edges of a long hole disposed on a side wall of the main body, the seal plate and main body being

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formed integrally from a soft flexible synthetic resin or a like material.

12. A debris collecting device as in claim 3 and the device being further characterized by an air cleaner having a main body and an internal chamber therewithin, a port being at one end of the chamber, the port connecting the internal chamber with an air suction port of a carburetor, the port having a swingable shutter for opening and closing the port, that shutter having an opening and closing arm portion penetrating through a seal plate formed to protrude outwardly along both edges of a long hole disposed on a side wall of the main body, the seal plate and main body being formed integrally from a soft flexible synthetic resin or a like material.

13. A debris collecting device as in claim 1, and also comprising:

(a) an air cleaner having a main body, an internal chamber within the main body, a one-way port having its one end located at one end of the chamber, the other end of the port being connected with the air suction port of a carburetor, the air cleaner having a cover portion for holding a filter against the opening of the internal chamber, a main body and a cover portion being integrally formed for foldability from a soft flexible material such as synthetic resin.

14. A debris collecting device as in claim 2 and being further characterized by an air cleaner having a main body, an internal chamber within the main body, a one-way port having its one end located at one end of the chamber, the other end of the port being connected with the air suction port of a

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carburetor, the air cleaner having a cover portion for holding a filter against the opening of the internal chamber, a main body and a cover portion being integrally formed for foldability from a soft flexible material such as synthetic resin.

15. A debris collecting device as in claim 3 and being further characterized by an air cleaner having a main body, an internal chamber within the main body, a one-way port having its one end located at one end of the chamber, the other end of the port being connected with the air suction port of a carburetor, the air cleaner having a cover portion for holding a filter against the opening of the internal chamber, a main body and a cover portion being integrally formed for foldability from a soft flexible material such as synthetic resin.

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ABSTRACT OF THE DISCLOSURE

The present invention proposes a new type of debris collecting device and a technique associated therewith which avoids the drawing of debris through the moving components of the suction device, is simple in construction, and easily separates and collects debris. A collecting passage is provided through which debris is drawn from the ground, which passage has a negative pressure therein due to flow thereacross through an intersecting flow passage.